MANTIS: Implementation

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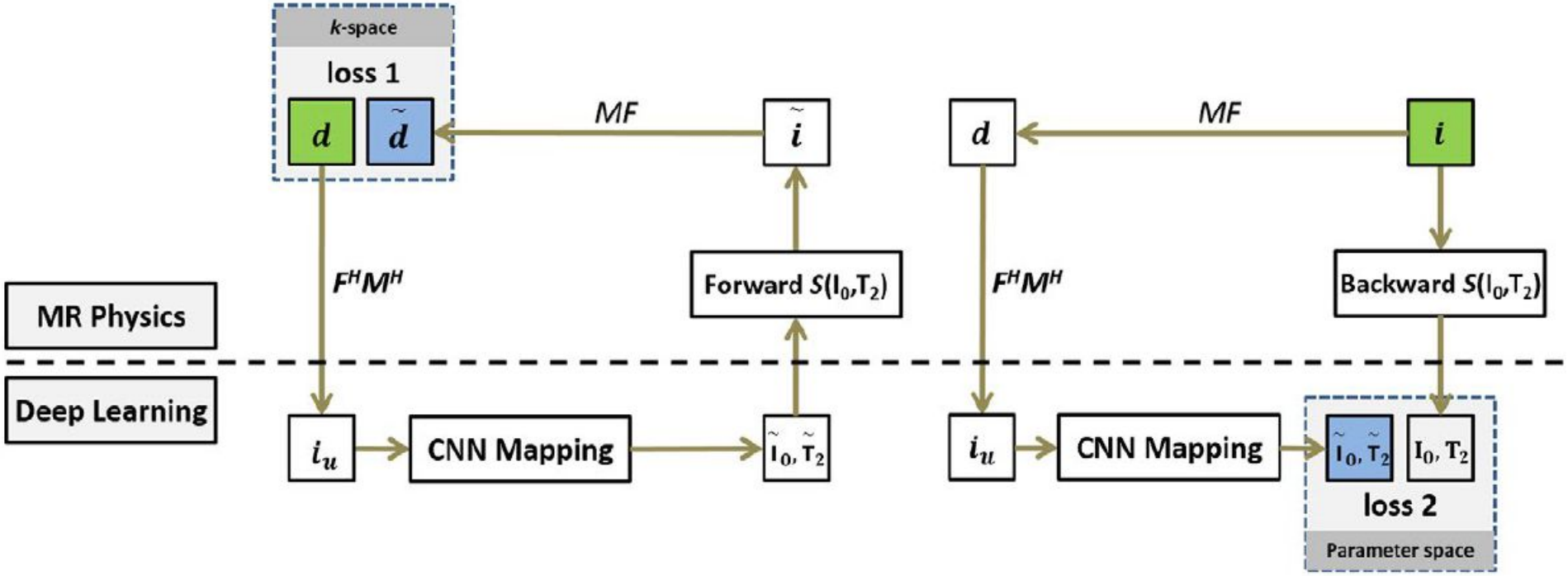
Overall process

$$\dot{\tilde{\theta}} = \arg\min_{\theta}\left(\lambda_{data}\mathbf{E}_{i_u\sim domain(i_u)}\left[\sum_{j=1}^{t}\left\|ES_j\left(C(i_u|\theta)\right)-d_j\right\|_2^2\right]+\lambda_{cnn}\mathbf{E}_{i_u\sim domain(i_u)}[\|C(i_u|\theta)-(I_0,T_2)\|_2]\right)$$



1) Data preparation

Reference
Proton density map
$(\hat{I}_0)$

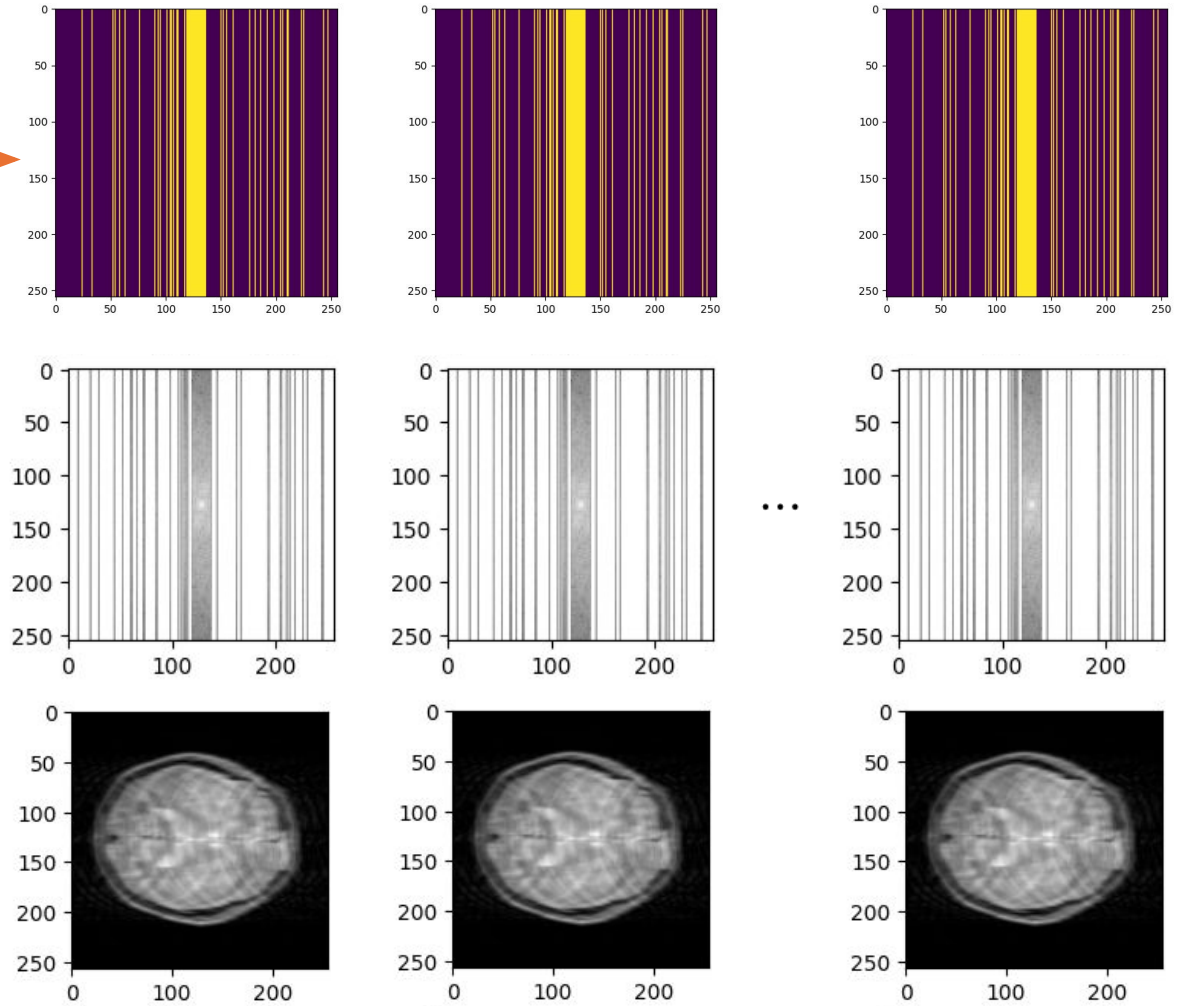
Reference
T_2 map
$(\hat{T}_2)$

$$i_j = I_0 \exp(-TE/T_2)$$

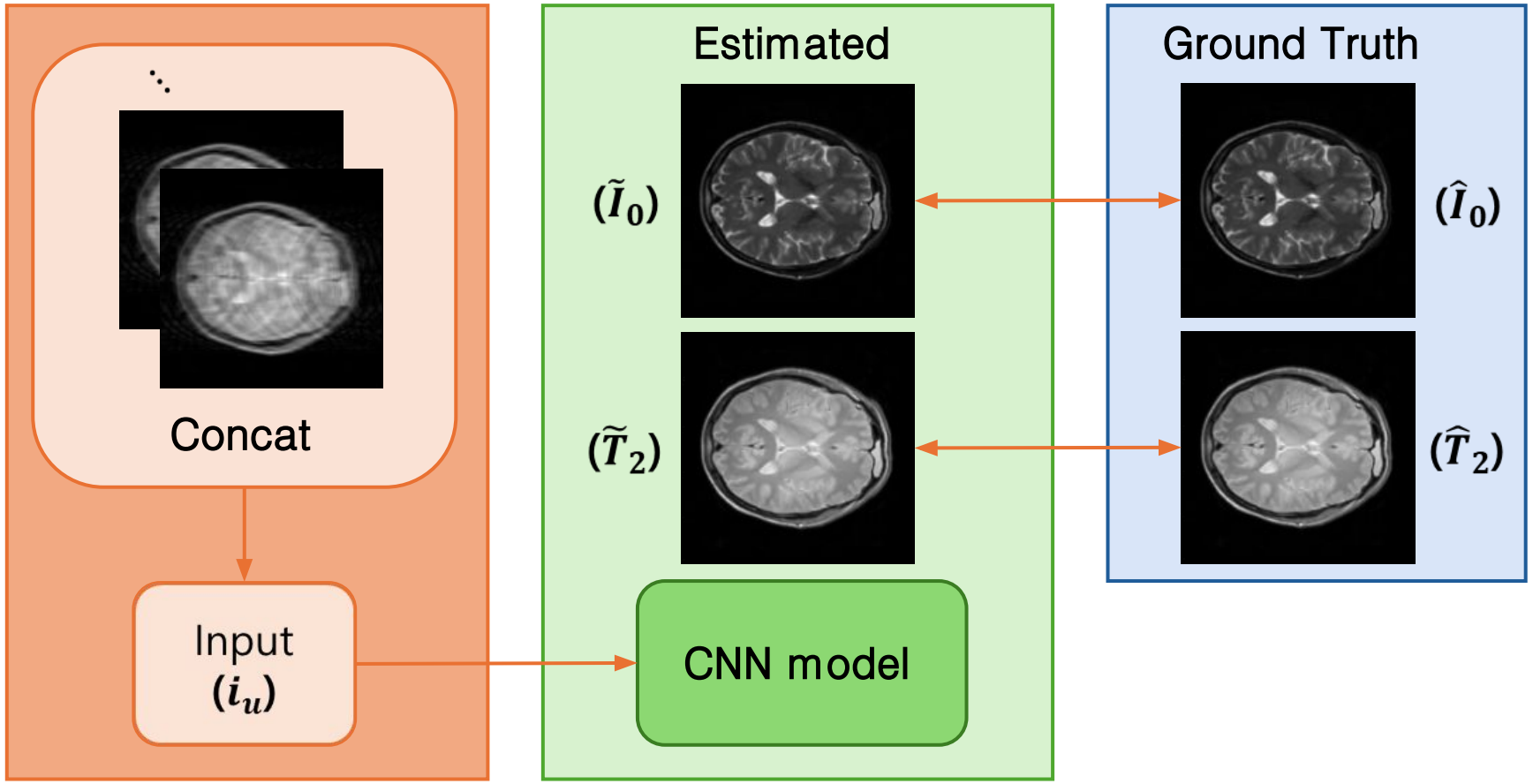
TEs = [7, 16, 25, 34, 43, 52, 62, 71] ms

Multi-echo images (i_j)

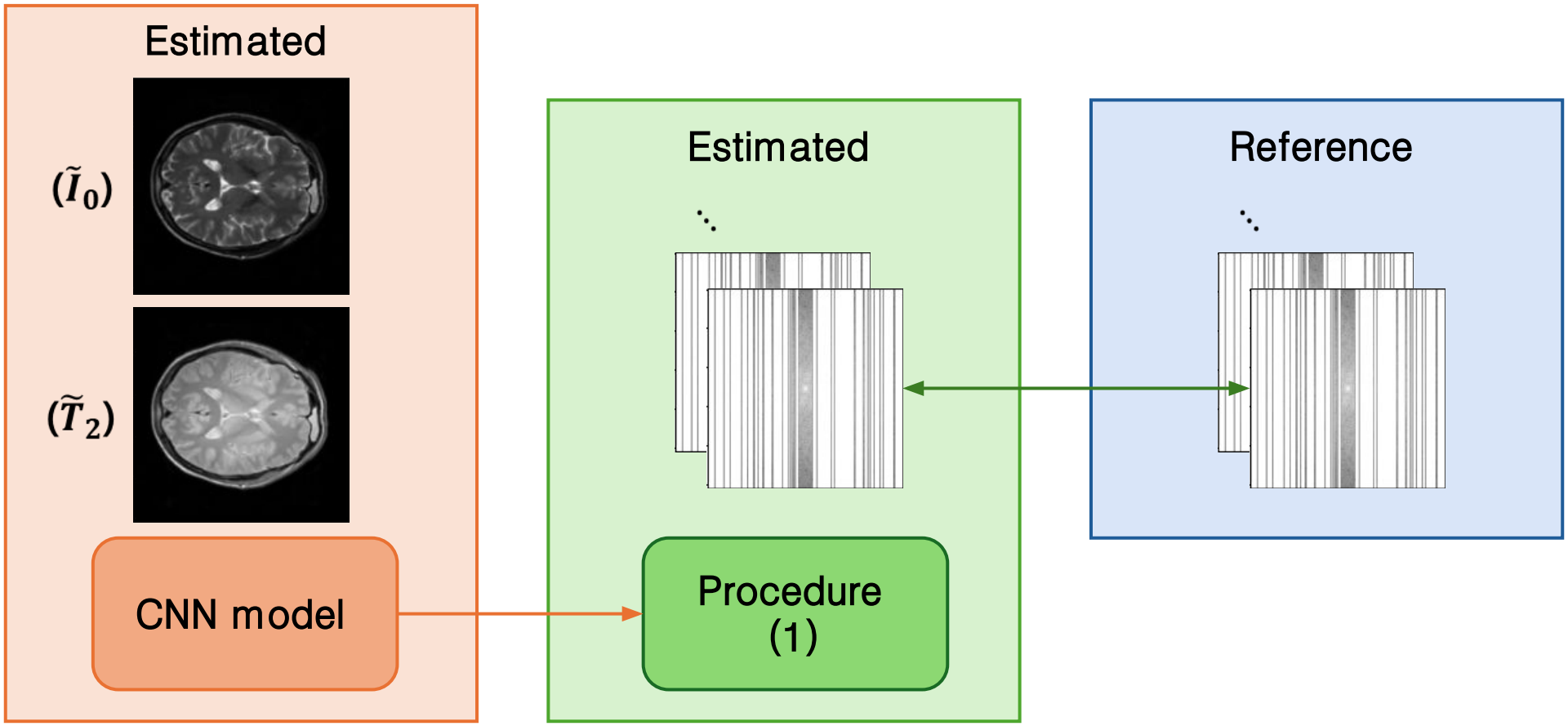
i_1 i_2 i_3 … i_8



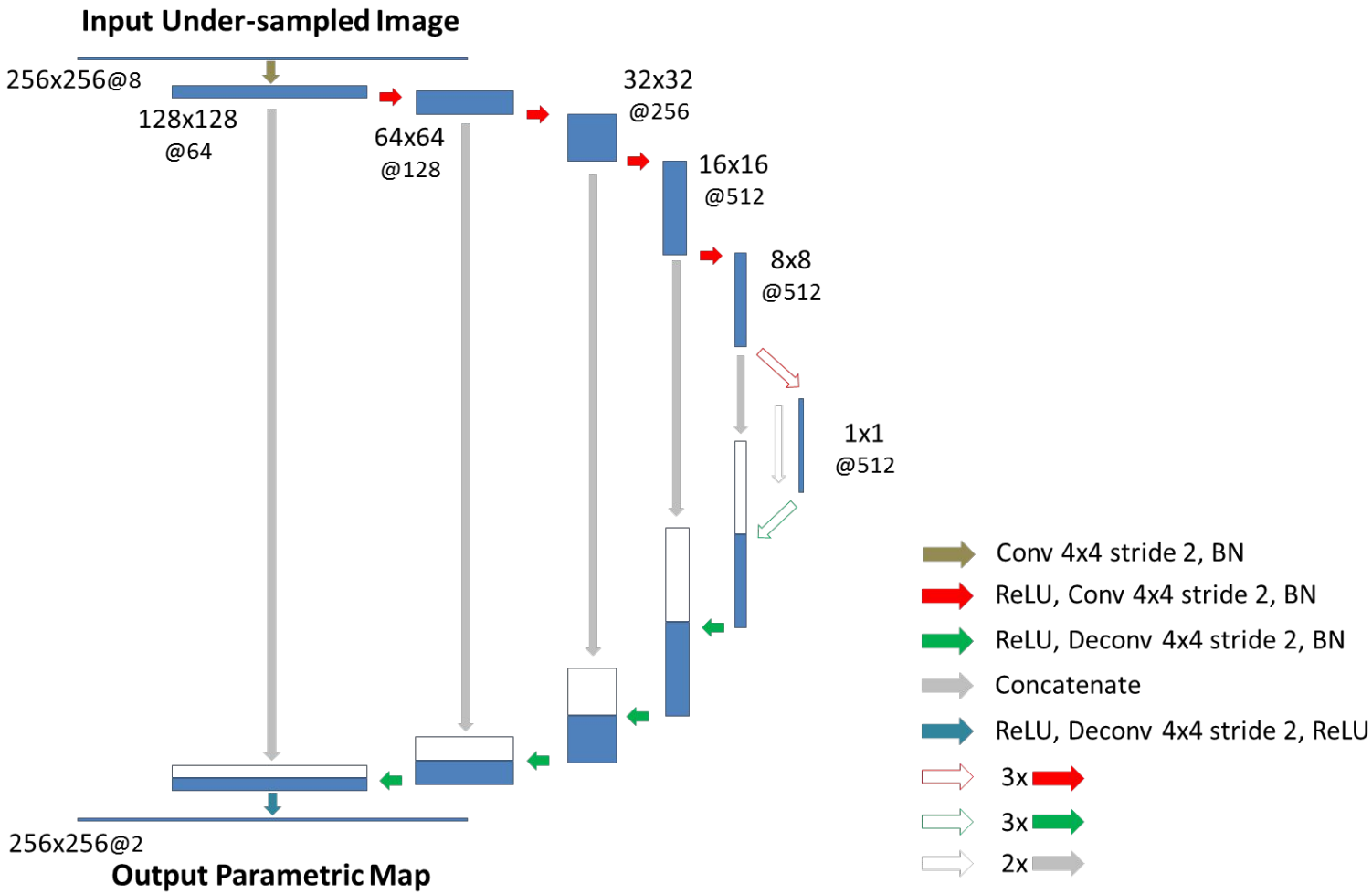
2.1) CNN Loss


Concat
Input
(i_u)
Estimated
$(\tilde{I}_0)$
$(\tilde{T}_2)$
CNN model
Ground Truth
$(\hat{I}_0)$
$(\hat{T}_2)$

2.2) Data Consistency Loss



UNet Architecture



Results

$$\lambda_{data} = 0.1, \lambda_{cnn} = 1.0, LR = 0.0002$$